

**LA5606N****BS/CS Tuner Regulator with On/Off Function****Overview**

The LA5606N is a low saturation regulator IC for BS/CS tuner applications, equipped with four regulators capable of ON/OFF control.

**Applications**

- BS/CS tuner power supply system.
- Audio Video (AV) equipment with BS/CS receivers.
- Compact electronic equipment.

**Functions**

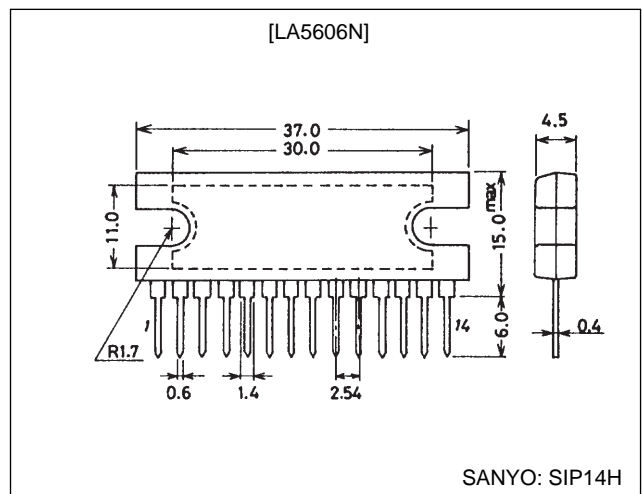
- Four low saturation regulators (15.7 V/300 mA, 12 V/150 mA, 9 V/100 mA and 5 V/500 mA).
- Output on/off control ("L" active).
- On-chip protective circuitry (current limiter, thermal shutdown).

**Features**

- Supports compact set design while incorporating four regulators needed by BS/CS tuners.
- Flexible system design by independent on/off control of  $V_{O1}$ ,  $V_{O4}$ , as well as  $V_{O2}$  and  $V_{O3}$  pair.
- Reduces internal loss by employment of low saturation regulators.
- Adapting three input pins contributes power dissipation reduction and heat sink design.

**Package Dimensions**

unit: mm

**3023A-SIP14H**

■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

**SANYO Electric Co.,Ltd. Semiconductor Business Headquarters**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

## Specifications

### Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input voltage	$V_{IN\text{ max}}$	$V_{IN1} \geq V_{IN2} \geq V_{IN3}$	35	V
Enable pin voltage	$V_{EN\text{ max}}$	EN1, EN2, EN3	$V_{IN\text{ max}}$	V
Allowable power dissipation	Pd max	With infinite heat sink	15	W
		With no heat sink	4.3	W
Operating temperature	Topr		-20 to +80	$^\circ\text{C}$
Storage temperature	Tstg		-55 to +150	$^\circ\text{C}$

### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Output current 1	$I_{O1}$	Regulator 1	5 to 350	mA
Output current 2	$I_{O2}$	Regulator 2	1 to 200	mA
Output current 3	$I_{O3}$	Regulator 3	1 to 150	mA
Output current 4	$I_{O4}$	Regulator 4	5 to 500	mA

### Operating Characteristics at $T_a = 25^\circ\text{C}$ and the specified Test Circuit

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Regulator 1 ( $V_{EN1} = \text{low}$ , $V_{O1}$ : ON, $V_{IN1} = 18.7\text{ V}$ and $I_{O1} = 300\text{ mA}$ )						
Output voltage 1	$V_{O1}$		14.9	15.7	16.5	V
Dropout voltage	$V_{DRO1-1}$			0.3	0.5	V
	$V_{DRO1-2}$	$I_{O1} = 150\text{ mA}$		0.15	0.3	V
Line regulation	$\Delta V_{OLN1}$	$17.5\text{ V} \leq V_{IN1} \leq 23\text{ V}$		20	100	mV
Load regulation	$\Delta V_{OLD1}$	$5\text{ mA} \leq I_{O1} \leq 300\text{ mA}$		40	200	mV
Peak output current	$I_{OP1}$		350	540		mA
Output short current	$I_{OSC1}$			150		mA
Output on control voltage	$V_{ENL1}$	$V_{O1}$ : On			1.0	V
Output off control voltage	$V_{ENH1}$	$V_{O1}$ : Off	4.0		$V_{IN1}$	V
Output low level voltage	$V_{O1\text{ OFF}}$				0.2	V
Output noise voltage	$V_{NO1}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		110		$\mu\text{Vrms}$
Ripple rejection	Rrej1	$f = 120\text{ Hz}$ , $18\text{ V} \leq V_{IN1} \leq 23\text{ V}$		50		dB
Regulator 2 ( $V_{EN2} = \text{low}$ , $V_{O2}$ : ON, $V_{IN2} = 15.0\text{ V}$ , $I_{O2} = 150\text{ mA}$ )						
Output voltage 2	$V_{O2}$		11.4	12.0	12.6	V
Dropout voltage	$V_{DRO2}$			0.3	0.5	V
Line regulation	$\Delta V_{OLN2}$	$12.6\text{ V} \leq V_{IN2} \leq 23\text{ V}$		20	100	mV
Load regulation	$\Delta V_{OLD2}$	$1\text{ mA} \leq I_{O2} \leq 150\text{ mA}$		20	70	mV
Peak output current	$I_{OP2}$		200	270		mA
Output short current	$I_{OSC2}$			70		mA
Output on control voltage	$V_{ENL2}$	$V_{O2}$ : On			1.0	V
Output off control voltage	$V_{ENH2}$	$V_{O2}$ : Off	4.0		$V_{IN2}$	V
Output low level voltage	$V_{O2\text{ OFF}}$				0.2	V
Output noise voltage	$V_{NO2}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		110		$\mu\text{Vrms}$
Ripple rejection	Rrej2	$f = 120\text{ Hz}$ , $13\text{ V} \leq V_{IN2} \leq 23\text{ V}$		50		dB
Regulator 3 ( $V_{EN3} = \text{low}$ , $V_{O3}$ : ON, $V_{IN3} = 12\text{ V}$ , $I_{O3} = 100\text{ mA}$ )						
Output voltage 3	$V_{O3}$		8.55	9.0	9.45	V
Dropout voltage	$V_{DRO3}$			0.3	0.5	V
Line regulation	$\Delta V_{OLN3}$	$10.45\text{ V} \leq V_{IN3} \leq 23\text{ V}$		20	100	mV
Load regulation	$\Delta V_{OLD3}$	$1\text{ mA} \leq I_{O3} \leq 100\text{ mA}$		20	50	mV
Peak output current	$I_{OP3}$		150	180		mA
Output short current	$I_{OSC3}$			40		mA
Output on control voltage	$V_{ENL3}$	$V_{O3}$ : On			1.0	V
Output off control voltage	$V_{ENH3}$	$V_{O3}$ : Off	4.0		$V_{IN3}$	V
Output low level voltage	$V_{O3\text{ OFF}}$				0.2	V
Output noise voltage	$V_{NO3}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		70		$\mu\text{Vrms}$
Ripple rejection	Rrej3	$f = 120\text{ Hz}$ , $11\text{ V} \leq V_{IN3} \leq 23\text{ V}$		55		dB

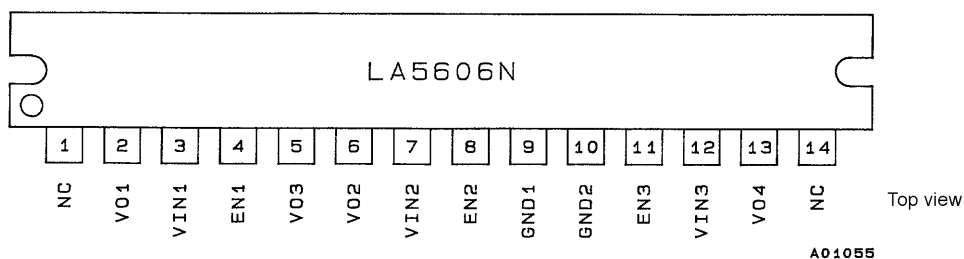
Continued on next page.

## LA5606N

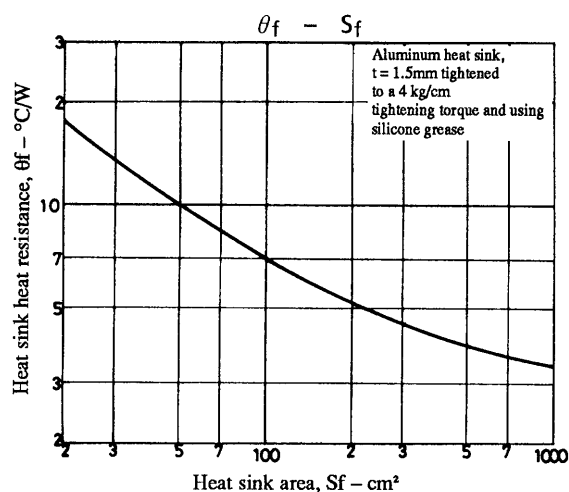
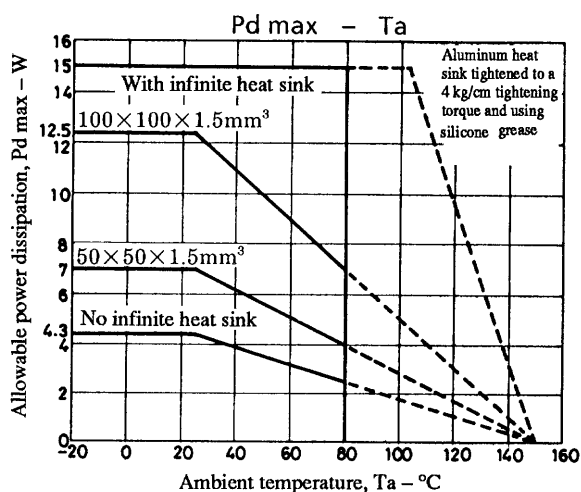
Continued from preceding page.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Regulator 4 ( $V_{EN3}$ = low, $V_{O4}$ : ON, $V_{IN3}$ = 8.0 V, $I_{O4}$ = 500 mA)						
Output voltage 4	$V_{O4}$		4.75	5.0	5.25	V
Dropout voltage	$V_{DROP4-1}$			0.3	0.5	V
	$V_{DROP4-2}$	$I_{O4}$ = 250 mA		0.2	0.4	V
Line regulation	$\Delta V_{OLN4}$	$6.25 \text{ V} \leq V_{IN3} \leq 23 \text{ V}$		20	100	mV
Load regulation	$\Delta V_{OLD4}$	$5 \text{ mA} \leq I_{O4} \leq 500 \text{ mA}$		30	150	mV
Peak output current	$I_{OP4}$		500	900		mA
Output short current	$I_{OSC4}$			250		mA
Output on control voltage	$V_{ENL3}$	$V_{O4}$ : On			1.0	V
Output off control voltage	$V_{ENH3}$	$V_{O4}$ : Off	4.0		$V_{IN3}$	V
Output low level voltage	$V_{O4}$ OFF				0.2	V
Output noise voltage	$V_{NO4}$	$10 \text{ Hz} \leq f \leq 100 \text{ kHz}$		70		$\mu\text{Vrms}$
Ripple rejection	Rrej4	$f = 120 \text{ Hz}$ , $7 \text{ V} \leq V_{IN3} \leq 23 \text{ V}$		60		dB
Current dissipation 1	$I_{Q1}$	$I_{O1}$ , $I_{O2}$ , $I_{O3}$ , $I_{O4}$ = 0		11		mA
Current dissipation 2	$I_{Q2}$	$I_{O1}$ = 300mA, $I_{O2}$ = 150 mA, $I_{O3}$ = 100mA, $I_{O4}$ = 500 mA		53		mA

### Pin Assignment

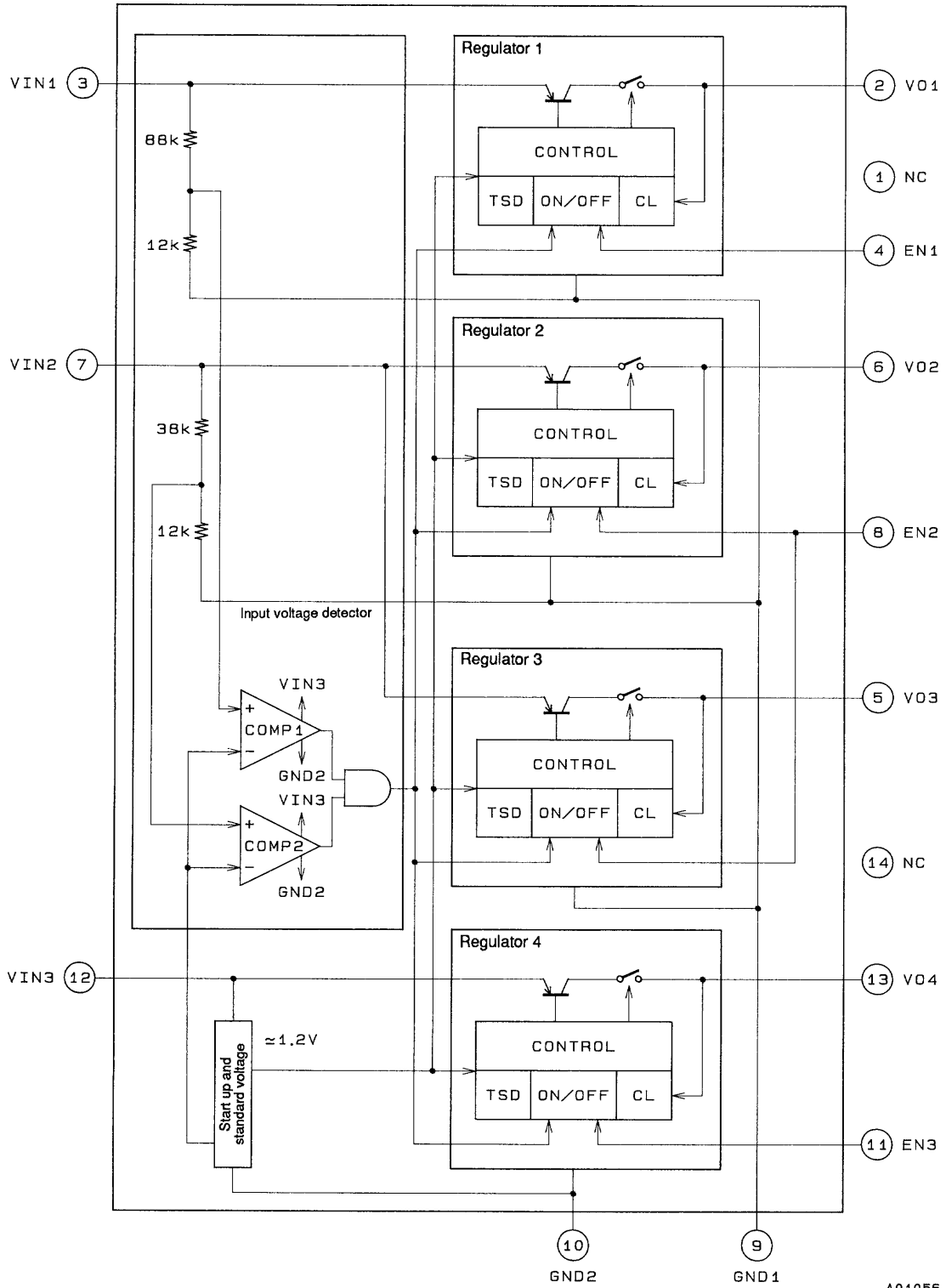


Note: The NC pins should not be used (No. 1 and No. 14 in the pin layout).



# LA5606N

## Block Diagram

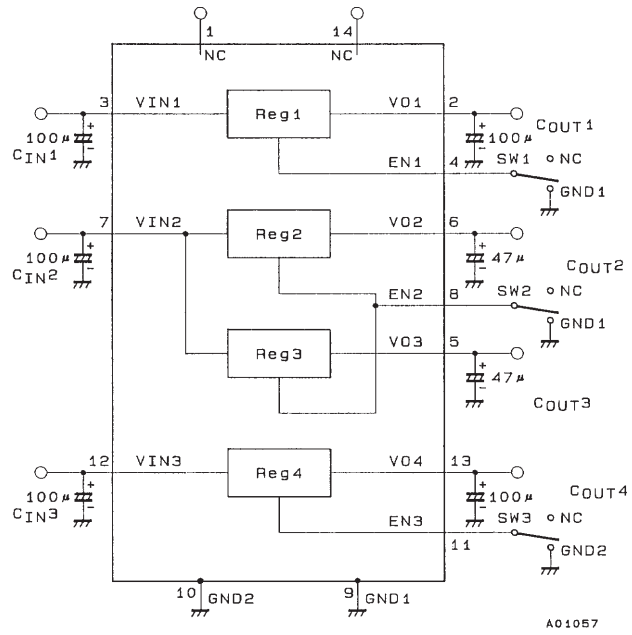


A01056

TSD: Thermal Shutdown Circuit  
 ON/OFF: Output on/off Control Circuit  
 CL: Current Limiter Circuit

Unit (resistance:  $\Omega$ )

Test Circuit



A01057

Unit (capacitance: F)

Function Table

The following table indicates conditions for operation with  $V_{IN1} \geq V_{IN2} \geq V_{IN3}$  ( $V_{IN1} \geq 11\text{ V}$ ,  $V_{IN2} \geq 6\text{ V}$  and  $V_{IN3} \geq 4\text{ V}$ ).

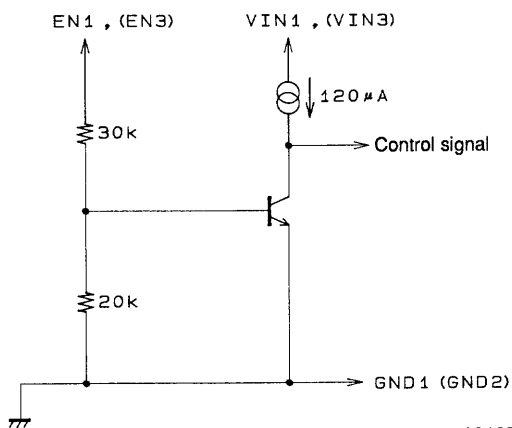
EN1, EN2, EN3	$V_{O1}, V_{O2}/V_{O3}, V_{O4}$
H	L
L	H

1. Within the table of EN “H” indicates an H level and “L” indicates an L level.
2. In the table of  $V_O$  “H” indicates an output on voltage while “L” indicates an output off voltage.
3. All output voltages corresponding to all EN locations are controlled independently.  
( $EN1 \rightarrow V_{O1}$ ,  $EN2 \rightarrow V_{O2}$  and  $V_{O3}$ ,  $EN3 \rightarrow V_{O4}$ )
4. When EN is open,  $V_O$  is at the H level.

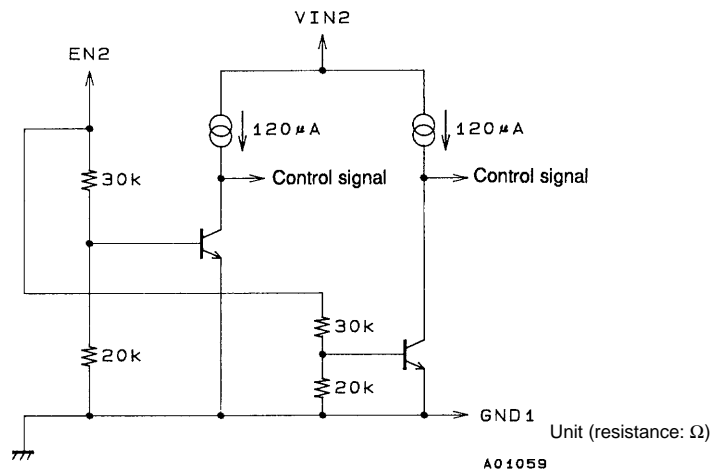
EN (On/Off Control) Input Equivalent Block Diagram

$V_{O1}$  ( $V_{O4}$ )

$V_{O2}$  and  $V_{O3}$



A01058



A01059

Unit (resistance:  $\Omega$ )

**Notes for Above Applications**

1. GND1 and GND2 should be at the same electric potential; since these are connected to the substrate of the LA5606N, the lowest possible electric potential should be used. (If the electric potential of GND1 and GND2 differ, performance characteristics of the LA5606N can not be guaranteed.)
2. Rise and fall times for  $V_{IN1}$ ,  $V_{IN2}$  and  $V_{IN3}$  should be unified and concerning these pins operating in an open-circuit state or connected to the ground state is forbidden.
3. When  $V_{IN1}$  and  $V_{IN2}$  are open or lower than the required value,  $V_{O1}$  to  $V_{O4}$  are forced off for the IC's protection.
4. Use output capacitors  $C_{OUT1}$  and  $C_{OUT4}$  rated at 100  $\mu$ F or more and  $C_{OUT2}$  and  $C_{OUT3}$  rated at 47  $\mu$ F or more. To prevent oscillation at low temperature, be sure to use less temperature sensitive capacitors.
5. In order to provide stable operation,  $C_{IN1}$  to  $C_{IN3}$  and  $C_{OUT1}$  to  $C_{OUT4}$  should be mounted as close to the LA5606N as possible.
6. The NC pins should not be used (No. 1 and No. 14 in the pin layout).
7. The output voltage of each voltage regulator is affected by a change in the load on the other voltage regulators.

- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of September, 1998. Specifications and information herein are subject to change without notice.